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OREGON FLORA
Newsletter

VOLUME 10, NUMBER 1 OREGON STATE UNIVERSITY FEBRUARY 2004

Katie Mitchell and Rena Schlachter join Oregon Flora Project staff

by Rhoda Love

Our staff is growing! The Oregon Flora Project hired two new employees early in 2004. Botanist and data manager Katie Mitchell, who hails from the state of Washington, joined the Project in January; and Rena Schlachter, an Oregon native and recent OSU graduate, was hired in May as the Project's first Illustrations Editor. We extend a warm welcome to our two new team members.

Katie is a native Washingtonian with a degree from the University of Washington and two majors, one in botany, and the other in ecology, evolution and conservation biology. Through post college studies she developed expertise in the use of Geographic Information Systems (GIS). In the summers, Katie worked as a field botanist for the National Park Service on the Olympic Peninsula as well as in eastern Washington, and she spent a couple of winters volunteering at the University of Washington Herbarium in Seattle. This diverse background serves her well in her new position. As she recently stated, "In my previous work I gained experience with databases, data management, and the Northwest flora that has been valuable in my present position."

Katie was hired to replace Ann Willyard who left the Project to pursue graduate work; she works half time for the Flora Project and half time for the OSU Herbarium; her

See Katie and Rena, page 2

Photo: Stephen Meyers

Katie Mitchell and Rena Schlachter

Tarweeds and silverswords – Californians on a Hawaiian vacation

by Kenton L. Chambers

It is a common event for Californians to travel to the Hawaiian Islands today, across 2,400 miles of open ocean, but could a botanical "long-range dispersal" like this have occurred 5 million years ago? Plant species that grow far away from their nearest relatives offer fascinating challenges to taxonomists. However, modern methods of genetics and biochemistry offer powerful tools to explain how such disjunctions in range originate. A newly published book, entitled *Tarweeds and Silverswords – Evolution of the Madiinae*, discusses the evidence for a relationship between the unique Hawaiian genera of Asteraceae called silverswords—*Wilkesia, Dubautia,* and *Argyroxiphium*—and such familiar Californian genera as *Madia*, the common tarweed. This relationship, which was suggested on the basis of microscopic characteristics of morphology, anatomy, and cytology (Carlquist 1959), had not previously been recognized by taxonomists working on the Hawaiian flora. The origin of the silverswords was unknown, and they were assumed to be unique to this group of islands. But an abundance of new information establishes these genera as a case of spectacular evolutionary diversification following the chance introduction, from California, of their single ancestral tarweed species approximately 5 million years ago. The evidence for the date and origin of this relationship comes mainly from DNA mutations in certain nuclear and chloroplast genes, analyzed by the new methods of biochemical cladistics. What may never be known, however, is what the ancestral tarweed looked like, and how some bird managed to transport its tiny seed (achene) to these oceanic islands so long ago.

Persons familiar with Oregon's flora usually associate the name "tarweed" with species of *Madia*, whose leaves and stems are well endowed with sticky, odoriferous glandular hairs. Other glandular-hairy tarweed genera are *Layia* (tidy-tips), *Hemizonia* (spikeweed), and *Calycadenia* (tackweed), while the related *Achyrachaena* (blow-wives), *Blepharipappus,* and *Lagophylla* (rabbit-leaf) are pubescent but mostly lack glands. In a major change from earlier taxonomic systems, the alpine genus *Raillardella* has recently been transferred from the *Senecio* group to the tarweed subtribe. Some other Californian genera important to the silversword story have now been given new, unfamiliar names, such as *Anisocarpus* and *Carlquistia* (formerly *Raillardella*), *Jensia*

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Katie and Rena, continued from front page

primary duties are managing and developing electronic databases and supervising student workers. She commented, "When I first saw the online Atlas, I was really impressed. It is a pleasure to apply my GIS skills in this position."

Rena Schlachter grew up in Gresham, Oregon where her parents are teachers. She graduated from Gresham High School and entered Oregon State University, where at first she was not certain whether she would major in art or biology. She noted, "I ended up somewhere in between with a Bachelor of Science in Fine Arts and minors in Biology and Philosophy." During her junior year Rena took advantage of a national exchange to West Chester University in Pennsylvania. Here she enrolled in special art courses and found opportunities to visit famous art galleries. She often spent Sunday afternoons at the Longwood Botanical Gardens taking pictures and sketching.

Rena's name is familiar to *Oregon Flora Newsletter* readers as she has been the production assistant for the newsletter since June 2003. In this position, she is responsible for our attractive layout and design. Rena now becomes the Oregon Flora Project's illustrator, and she will continue her work with the newsletter. Rena also assists with the Oregon Photo Gallery which she describes as "a growing collection of donated images of noncultivated plants in Oregon. Our goal is to obtain images of each taxon's habitat, important characters, representative herbarium specimens and illustrations."

Rena recently commented on her new position, "I have found all the individuals who are committed to the Oregon Flora to be amazingly zealous about the project and its goals. I feel privileged to have been hired as part of this wonderful endeavor." Katie echoed these sentiments when she stated, "It is very exciting to be working on a new Flora for Oregon. I enjoy working with the people on the project, especially the volunteers and students who do so much to move us toward our goal."

Welcome, Katie and Rena. Your expertise and enthusiasm greatly enrich our Project.

Erythronium oregonum logo and masthead designed by Tanya Harvey.

The Oregon Flora Newsletter is published three times a year by the Oregon Flora Project and the Oregon State University Herbarium. The Editor is Rhoda Love and the Production Assistant is Rena Schlachter.

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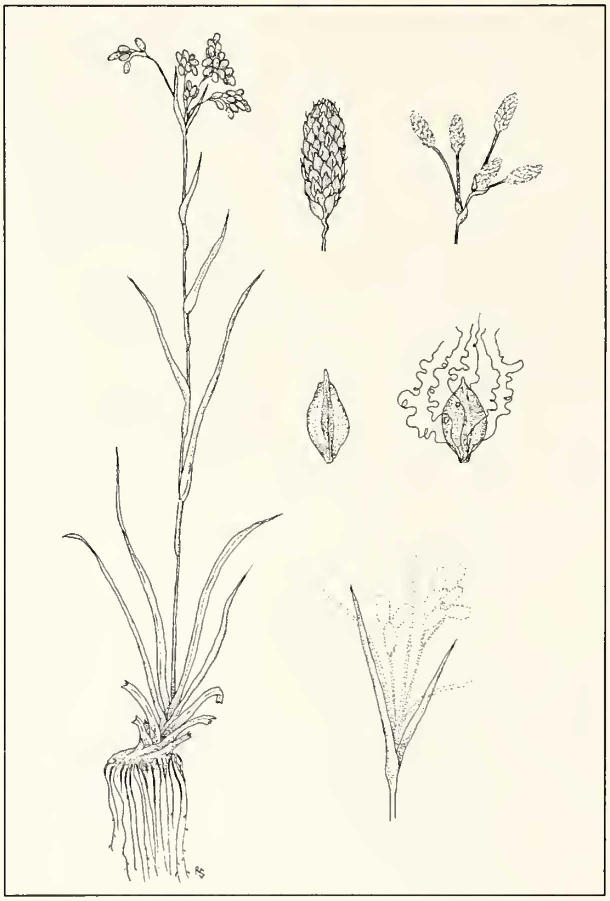


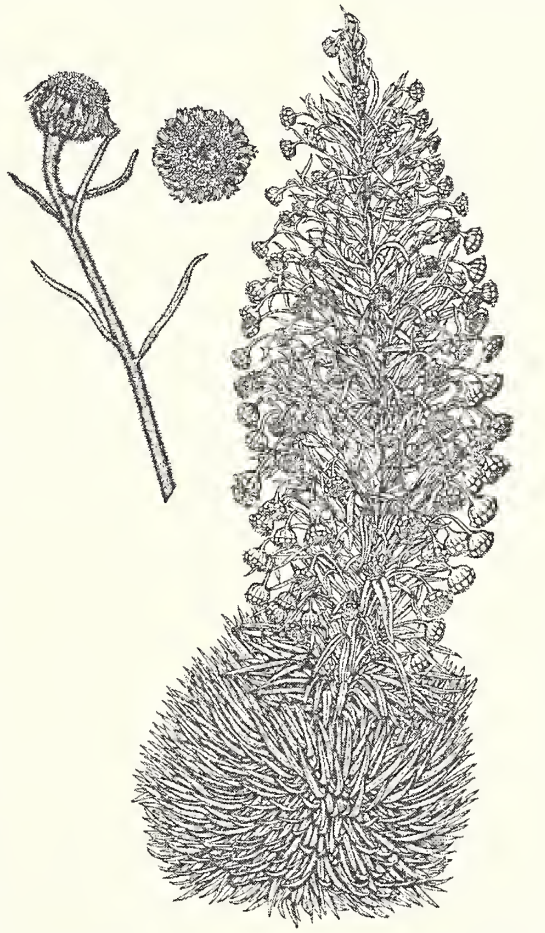
Scirpus pendulus *(drooping bulrush), is a rare Oregon plant illustrated by Rena Schlachter for the OFP's Rare Plant Guide (2003). The species inhabits marshes, moist meadows, and ditches, often on calcareous soils, and is found in Oregon and California, though not in neighboring Nevada, Idaho or Washington. It is, however, abundant throughout the eastern United States. Until 1966,* Scirpus pendulus *was misidentified as* Scirpus lineatus, *which is found only in the American southeast.* Scirpus pendulus *is scabrous near the nodes and on the rays and pedicels, whereas,* Scirpus lineatus *is often scabrous throughout the plant. (See map back page.)*

Tarweeds, continued from front page

and *Harmonia* (formerly *Madia*), and *Deinandra* and *Centromadia* (formerly *Hemizonia*).

The three Hawaiian genera, called the "silversword alliance," contain 30 species and 41 additional subspecies. These entities are morphologically highly diverse and occur on all the major islands, occupying almost the full range of available habitats, from dry lava flows, pumice barrens, and brushlands to wet forests, rain-drenched cliffs, and high-elevation bogs. Many taxa are classified as rare and endangered. Probably the most famous species, for its spectacular appearance and extreme habitat, is the Haleakala Silversword (*Argyroxiphium sandwicense*), which grows at 10,000 feet on the barren volcanic slopes of Haleakala crater, Maui. Its cluster of dagger-like leaves, covered with silky hairs, mimics a yucca plant; strangely, each individual produces a mass of blooms just once, and then dies. All the species of this alliance are woody perennials, which differentiates them from the annuals and herbaceous perennials of the mainland genera. Their growth forms include tufted rosette plants like *Argyroxiphium*, along with cushion-plants, multiple-stemmed shrubs, lianas, forest trees (*Dubautia*), and naked-stemmed rosette trees with monocot-like leaves borne in a terminal cluster on a pole-like trunk up to 5 m. tall (*Wilkesia*).

Despite their remarkable diversity, the Hawaii silverswords appear to be closely related genetically, such that hybrids are possible between almost every pair of taxa, when controlled cross-pollinations are made. Hybrids occur in nature, as well, even between species with very different growth forms. A second notable feature is that all the silversword species are polyploid, their somatic chromosome numbers being 2n=26 or 28. These numbers are tetraploid, approximately four times the most common gametic numbers in *Madia* and its allies (where n=6, 7, 8, and 9). In tetraploids, with 4 sets of chromosomes, it may be possible—using modern molecular methods—to pinpoint the duplication of certain genes and trace their origins. When this was done for the silverswords (Barrier et al. 1999), not only were two duplicate genes found, but the two copies of each had close affinity with the genes of *two* different modern California tarweed species! This strongly implies that the ancestor of the silverswords was a polyploid hybrid between two species on the California mainland, and that its seed was bird-dispersed to Hawaii (tarweed achenes can't survive immersion in salt water). The ancestral tetraploid meanwhile became extinct in California, leaving only its diploid relatives whose descendents persist to the present day.



Haleakala Silversword, Argyroxiphium sandwicense. *Height 1.8 m. (Drawing from Otto Degener,* Flora Hawaiiensis.*)*

Among the modern tarweed taxa showing close molecular affinity with the silverswords are *Madia sativa* (coast tarweed), *Kyhosia bolanderi* (formerly *Madia bolanderi*, Bolander's tarweed), *Anisocarpus madioides* (formerly *Madia madioides*, woodland tarweed), *Carlquistia muirii* (formerly *Raillardella muirii*, Muir's raillardella), and *Anisocarpus scabridus* (formerly *Raillardella scabrida*, leafy raillardella). The first three of these are familiar Oregon species, all formerly associated in the genus *Madia*. The last two grow above 1000 m. in the California Coast Range and northern Sierra Nevada. They were found, upon molecular DNA analysis, to be particularly close to the Hawaii silverswords. Bruce Baldwin, a principal author of the "new taxonomy" of Madiinae, placed them in *Raillardiopsis* in *The Jepson Manual*; however, he later reclassified these and the other species mentioned above into separate genera. This new classification reflects the phylogenetic evidence, from DNA-based cladistic research, that a number of separate and distinct evolutionary lines exist *within* the older genera *Madia* and *Raillardella*. As in the other "compound" genus *Hemizonia*, these so-called monophyletic clades are to be assigned their own unique generic names.

The geological history of the volcanic Hawaiian Islands is well understood, and the geographical origin and spread of their native biota—plants and animals—can be related in time to the origins of the major islands (see Wagner and Funk 1995). Detailed studies of the silverswords (Baldwin 1997) point to an origin on Kaua'i, the oldest and most western of the islands. *Dubautia* has the largest number of endemic species there (9), and *Wilkesia* is found only on Kaua'i. Results of the molecular-cladistic studies also support an origin on this island—with one exception. *Argyroxiphium*, a plant of high elevation pumice slopes on the younger volcanoes of Maui and Hawai'i, is not on Kaua'i. Baldwin and co-authors propose that the genus may have evolved on Kaua'i when the island was young and volcanically active. When volcanism ceased and the mountain became forested to the summit, the genus' habitat was lost there, but migration took it to the younger volcanoes erupting to the east. The approximate ages of the major islands are Kaua'i 5.0 million years, O'ahu 2.5 million, Maui 1.0 million, and Hawai'i 400 thousand. Thus, the first Californian tarweed ancestor came to Kaua'i around 5 million years ago, and as new islands arose, its descendents evolved, spread, and

See Tarweeds, page 4

Tarweeds, continued from page 3

diversified into the present-day silversword alliance—the most striking example of adaptive radiation in the world's island floras.

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Project news

by Oregon Flora Project Staff

The Oregon Flora Project is achieving important goals. Student workers, volunteers, and staff are collaborating on the Oregon Plant Atlas, a Rare Plant Guide, a Digital Field Guide and the Oregon Photo Gallery.

Additions to the Oregon Plant Atlas continue as the remainder of the Oregon State Herbaria's specimens are databased. We are also fine tuning and trouble-checking the atlas by weeding out erroneous points on the maps. Such points are usually caused by the misidentification of a taxon, occasionally by a mapping mistake, and rarely by a database entry error. All potential errors are carefully researched until a resolution can be made. Using GIS (Geographic Information Systems), we have improved georeferencing of township, range and section locations, as well as rivers and creeks. Georeferencing has kept pace with specimen data entry, with over 125,000 Oregon specimens entered so far. The Oregon Plant Atlas is available for preview by newsletter readers at: www.oregonflora.org/oregonplantatlas.html. Our next newsletter will explore the Atlas in depth.

In collaboration with the Oregon Natural Heritage Information Center, we are compiling a Rare Plant Guide of Oregon's most endangered taxa which will be available to the public via the internet. Each taxon will be accompanied by a description, a list of look-alikes, distribution data, habitat type, elevation range, best survey time, and photographs.

The initial data to construct a Digital Field Guide is currently being collected. In addition to information from the regional floras, we are gathering morphological data from herbarium specimens. The Field Guide will eventually provide detailed descriptions and images of each taxon in Oregon as well as a user-friendly electronic key.

The Oregon Photo Gallery is growing rapidly as we have recently added several large slide collections. Wilbur Bluhm, Glenn & Barbara Halliday, and Don Roberts have volunteered many hours to the expansion and organization of our slide collection. Student workers have been scanning and databasing slides to achieve our goal of obtaining digital images for all of Oregon's recognized taxa. We have compiled a list of species for which we need images. If readers are interested in viewing this list, or would like to donate slides to the project, please visit: http://www.oregonflora.org/oregonphotogallery.html.

As many readers are aware, Oregon Flora Project Coordinator Scott Sundberg has been ill for several months. He is now working part time and recovering at home. He expresses his appreciation to project staff and volunteers for the great progress that has recently been made on the project. He also sends his thanks for the many good wishes he has received. ---Editor

Photo: Rhoda Love

The Oregon Flora Project Staff. Left to right: Stephen Meyers (graduate student worker), Rena Schlachter, Linda Hardison, Thea Cook, and Katie Mitchell.

Thanks

Thanks to the following who have contributed to the Oregon Flora Project: the Native Plant Society of Oregon and its Cheahmill Chapter, the Portland Garden Club, and Friends of the Hoyt Arboretum. Thanks to Greg Sundberg who donated in honor of Norman Sundberg's birthday, and to Louise Godfrey and Susan Bodin who donated in memory of Joyce Beeman.

Special thanks to the following individuals who donated in memory of Bonnie Hall: Margaret Anderson, Charlaine Beschta, Martha Brookes, Alice Burbott, Patrick Canan, John Carter & Kris Kirkeby, Ken & Henrietta Chambers, Marjorie Chilcote, Sue Conte, Susan Cowles, Pearl Doolin, Karan Fairchild, Linda Hadfield, Jim Hall, Nancy Hemming, Elaine Hodges, Nancy Klingeman, John Lattin, Judith Li, Jane Loomis, Elizabeth Mannareno, Robert Jarvis, Richard Mason, Patty McClintock, Esther McEvoy, Janet Phillips McKensey, E. Charles Meslow, Mary Murphy, Sally Olson-Edge, Nancy Wilson Orcutt, Joann Overton, Ellen Petersen, Maryann & Robert Phillips, Patricia Potts, Dr. & Mrs. Robert Pyle, Dell Rhodes, Katherine Skelton, Yvonne Stevens, Thomas Struhsaker, Linda Hardison & Scott Sundberg, Marolyn Tarrant, Harry Wagner, Charles & Agnes Warren, Deanna Watkins, Jody Waugh, Barbara Weber, Kris White, Nancy White, and R.E. & Allene Wickman.

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Thanks to the following who have volunteered time and energy: Barbara & Glenn Halliday, Troy Maddux, Gene Newcomb, Joan Ojerio, and Don Roberts.

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Tenth anniversary challenge drive: your dollars will be doubled!

by Linda Hardison

Ten years ago research began at OSU for a new Flora of Oregon. Those of us involved with the Oregon Flora Project have seen many changes in the last ten years. We have watched the project grow from an idea and a rudimentary checklist into a multifaceted resource involving hundreds of volunteers, staff, and users.

For its first 7 years, the Oregon Flora Project was funded almost exclusively by the sponsorship of the Native Plant Society of Oregon (NPSO) and donations from individuals. The countless hours of volunteer work by Scott Sundberg, project leaders, checklist contributors, and dedicated supporters created the building blocks for the Oregon Flora Project. From this foundation, further support has been awarded and collaborations forged to expand the scope of the project to include the checklist, a new flora, an atlas of plant distributions, and a photo gallery.

Like all growing things, the Oregon Flora Project needs nourishment in the form of your financial support! Several generous donors have offered to match contributions made to the Oregon Flora Project from now through January 31st. This challenge is an excellent opportunity to show your support for this critical botanical resource, and to double the impact of your gift. Because the challenge drive extends into the new year, you have the opportunity to contribute twice, and apply your tax-deductible gifts to two calendar years.

Help us celebrate ten years of botanical research by supporting the Oregon Flora Project's challenge drive!!!

Checks should be made out to NPSO, with "OFP Challenge" on the memo line, and mailed to:

Friends of the Oregon Flora Project
P.O. Box 402
Corvallis, OR 97339-0402.

Alternatively, your check may be made out to the OSU Foundation (memo to "Oregon Flora Project") and mailed to the same address. *All funds go to the Flora Project, whichever way you choose to donate.*

Would you like to make a donation?

Tax-deductible donations can be made to the Oregon Flora Project in two ways:

(1) A check made out to the Oregon State University Foundation, mailed to Scott Sundberg at the address on page 2.

(2) A donation to the Friends of the Oregon Flora Project, with a check made out to Native Plant Society of Oregon, and mailed to P.O. Box 402, Corvallis, OR 97339-0402.

For either, please note on the check that it is for the Oregon Flora Project. Your donations are used to support newsletter expenses and other activities of the project.

☐ Please check here if you do not wish to have your name listed in our "Thanks" column.

☐ Please put me on the *Oregon Flora Newsletter* mailing list.

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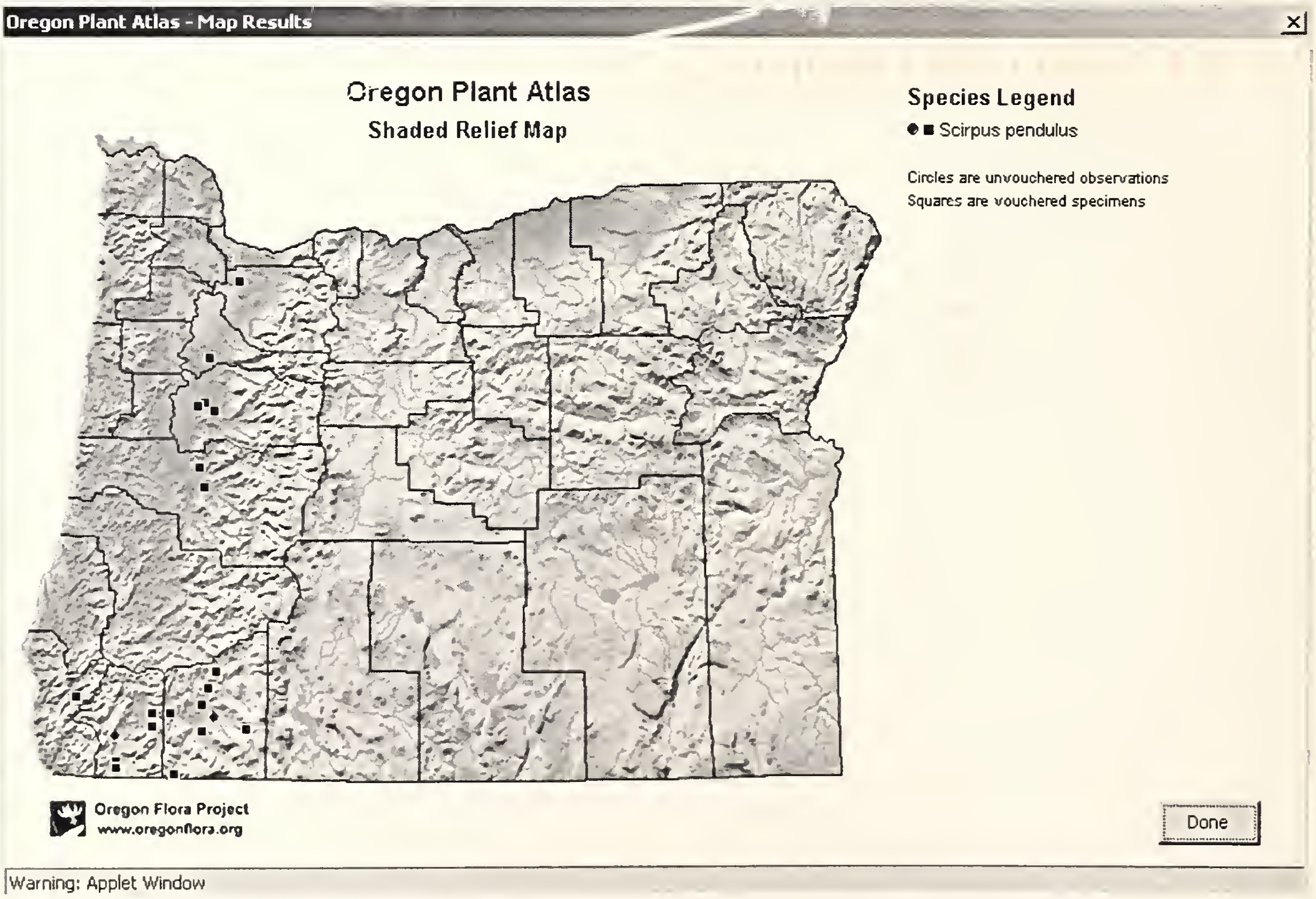

Oregon Plant Atlas - Map Results

Oregon Plant Atlas

Shaded Relief Map

Species Legend

● ■ Scirpus pendulus

Circles are unvouchered observations
Squares are vouchered specimens

Oregon Flora Project
www.oregonflora.org

Warning: Applet Window

Oregon sites for Scirpus pendulus *(drooping bulrush), from the online Atlas. (See illustration on page 2.)*

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OREGON FLORA *Newsletter*

VOLUME 10, NUMBERS 2&3 OREGON STATE UNIVERSITY JUNE / OCTOBER 2004

ANNOUNCING THE OREGON PLANT ATLAS!!

This combined issue is devoted to the Oregon Plant Atlas, addressing its status as of our actual publication date, June 2005. After many years of work, we are making this resource available to the general public. This combined issue provides articles about the database, the mapping program, how the Atlas has evolved, and the people who have made it happen. Also included is a special pull-out guide to using the Atlas. The Atlas can be accessed through the Oregon Flora Project website at www.oregonflora.org.

Scott Sundberg Oregon botanist, 1954-2004

by Aaron Liston
Oregon State University Herbarium Director

Scott Sundberg, director of the Oregon Flora Project, died December 30, 2004 of cancer. He had struggled for many years, most of them privately, with the symptoms of multiple sclerosis. Yet it was cancer, diagnosed only in September 2004, which led to his passing.

Scott Donald Sundberg was born February 10, 1954 in Eugene, Oregon. Scott began his botanical career as an undergraduate at the University of Oregon. Among Scott's early scientific mentors were Prof. George Carroll and George's wife, Fannie. Scott was involved in studies at the H.J. Andrews Experimental Forest, where he collected the type specimen of a rare lichen, *Nephroma occultum*. Scott became fascinated with plant taxonomy, and soon was conducting independent study projects

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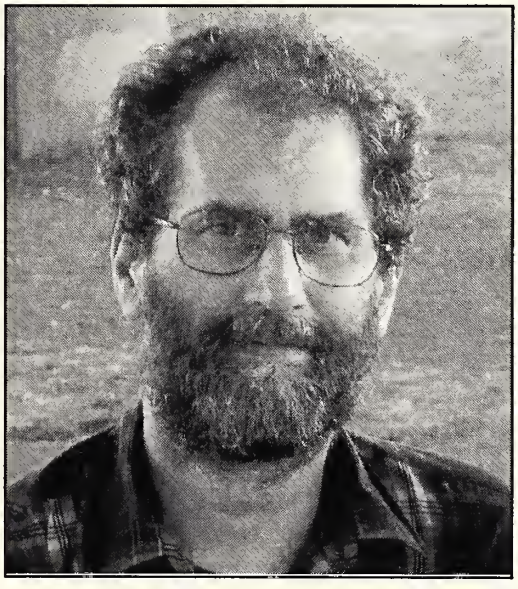

Photo: Mark Sundberg

Scott Sundberg, 1954-2004.

The future of the Oregon Flora Project

by Linda Hardison
Oregon Flora Project Coordinator

I have followed the progress of the Oregon Flora Project for many years due to my long and close relationship with Scott Sundberg (we had been together since 1983). I realize that Scott's goal to prepare a new flora for Oregon germinated long before I knew him; however, I have been witness to over two decades of its development and growth. The present public release of the Atlas represents a significant accomplishment and is one of many that will grow from the dream Scott nurtured.

The Flora will follow a well-planned path to its completion thanks to Scott's vision. Limited funds have kept our staff numbers small, yet our workers are highly skilled and dedicated. Collaborations with NACSE and the OSU Herbarium led to federal grants which have funded software development for the online presentation of data and the databasing of the Oregon specimens. As these projects approach completion their fruits can be seen in the rich data set supporting the Oregon Plant Atlas. They will also be evident in a Digital Field Guide soon to be launched on our website.

Scott developed collaborations with botanists, photographers, cartographers, and programmers throughout the state. Recognizing that skills do not lie exclusively with professionals or academics, he nurtured relationships with amateur plant enthusiasts, high schoolers, retirees, and others who, appreciating what the Flora Project can offer, have volunteered skills and support. Volunteerism will continue to be a key to the success of our undertaking; it is an aspect of our Project to which we owe both respect and gratitude.

The Oregon Flora Project will advance on several fronts in the upcoming year. To aid authors of our treatments of families and genera, the Checklist databases have been restructured, and the process for preparing manuscripts is being streamlined. An April meeting of the Checklist project leaders and

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Scott, continued from front page

in the University of Oregon Herbarium. Scott benefited from working with two herbarium curators: recently-retired Georgia Mason, and newly-hired David Wagner. Scott graduated from the University of Oregon in 1978 with a B.Sc. (Honors) in Biology. From 1978 to 1980, Scott was employed as a botanist for the Bureau of Land Management, Coos Bay District. During that period, he gained considerable experience with the flora of southwestern Oregon. He made numerous noteworthy collections, and discovered new localities for many rare plant species.

> *"The Atlas is such a treasure. I keep finding new ways to use it, new kinds of questions for it to answer, new ways to answer old questions. It is a reference librarian's delight! Many thanks to Scott and to all of you good people who had the vision and perseverance to make it happen and who keep making it even better."*
>
> — Connie Hopkins Battaile, retired librarian, Ashland, OR

In 1981, Scott moved to Austin, Texas, to begin graduate studies at the University of Texas. He worked under the supervision of Prof. Billie Turner, and, like almost of all of Turner's students, Scott turned his attention to the composite family. Scott's taxonomic research in the Asteraceae continued throughout his career. Scott received his Ph.D. in Botany in 1986. His dissertation was entitled "The Systematics of Aster Subg. Oxytripolium (Compositae) and Historically Allied Species."

Scott met his wife, Linda Hardison, in Austin. They married in Jakarta, Indonesia on August 13, 1986. That year, Scott began a one-year post-doctoral position at Ohio State University, working with Prof. Tod Stuessy. The following year, the couple returned to the Pacific Northwest as Linda began her Ph.D. studies at the University of Washington. Over the next several years, Scott taught courses and conducted plant systematics research in the Department of Botany. From 1991-1994, Scott was a Botanical Consultant for Ebasco Environmental, Inc. in Bellevue, Washington. During that time he conducted rare plant surveys throughout Oregon and Washington.

Scott moved to Corvallis in early 1994, and Linda joined him in 1996 after completing her dissertation. Scott was hired to oversee the integration of the University of Oregon and Oregon State University Herbaria. Soon after, Scott initiated the Oregon Flora Project. In 1999, Scott was promoted to a Research Assistant Professor. The same year, Scott and Linda's son Matthew was born.

Scott's 29 scientific publications include taxonomic papers (descriptions of new species, nomenclatural changes, and new classifications), laboratory-based investigations in plant systematics, and treatments for checklists, field guides, and floras. The majority of his publications concern the composite family. In addition, Scott has contributed numerous articles to the *Oregon Flora Newsletter*. A complete list of his scientific publications will appear in the on-line version of this publication.

Scott devoted the last decade of his life to the Oregon Flora Project. As Coordinator, he directed over 230 volunteers and supervised over 60 student and several professional employees. He established the *Oregon Flora Newsletter*, the Oregon Vascular Plant Checklist, and the Oregon Plant Atlas. It is tragic that Scott did not live to see the completion of his dream, a comprehensive Flora for the approximately 4,500 Oregon plant species. However, his activities created an extremely strong foundation for the continued growth of the Oregon Flora Project. The Flora will serve as an enduring legacy to Scott's commitment to botanical education, and the documentation and conservation of Oregon's unique and diverse flora.

A memorial service celebrating Scott's life was held in January 2005 in Corvallis, OR. Memorial gifts in his honor can be made to NPSO, Oregon Flora Project, and mailed to P.O. Box 402, Corvallis, OR 97339.

- Aaron Liston, Oregon State University Herbarium Director

Erythronium oregonum logo and masthead designed by Tanya Harvey.

The Oregon Flora Newsletter is published three times a year by the Oregon Flora Project and the Oregon State University Herbarium. The Editor is Rhoda Love and the Production Assistant is Rena Schlachter.

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> *"I've just used the website for the Atlas mapping program for the first time. The announcement in the NPSO bulletin asks for comments. My comment is "WOW!" This is a fantastic resource. Thank you for making it widely available. I'm sure I will be using it regularly for teaching and research."*
> — Prof. Mark Wilson, Dept. Botany & Plant Pathology, OSU

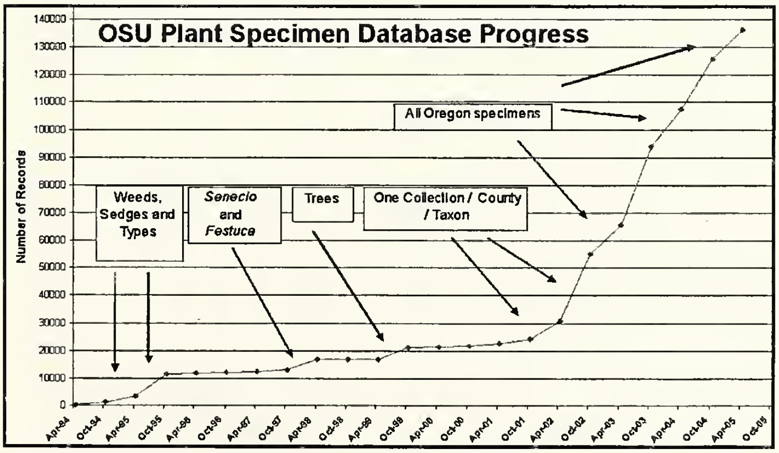
Future of OFP, continued from front page

advisory board infused new energy into this important facet; all participants will be helping us meet our goal of completing the Checklist by Spring 2006.

At the end of this summer, we will launch a prototype of the Digital Field Guide. Within its framework, a user visiting our website (*www.oregonflora.org*) will be able to key an unknown plant to family (and in some families, identify that plant to species), view photos, check nomenclature, and connect to the Atlas mapping program. While the number of taxa initially presented will be limited, the upcoming years will see the addition of depth and breadth to this framework. Current, accurate plant data is critical for progress in many arenas; the Oregon Flora Project is working to develop collaborations and joint grant proposals that will apply our data in new contexts, thereby increasing the value of the information.

What do I see for the future of the OFP? Through my lens of historical perspective and with my current view as coordinator, I see the continuing development of a carefully designed, rigorously curated body of plant information that will be the primary source for Oregon plant data tapped by users of all interests and abilities. I see our project as a model for others wanting to create a similar resource. I see our data being accessed through many online venues, contributing to a more comprehensive knowledge of biodiversity. I also see the need constantly to improve and monitor the information we present to the world. Oregon's plant life is a dynamic system; as observers and disseminators of information about this system, we must keep pace with its changes.

Acquiring the financial means to accomplish this future goal is a constant challenge. The cost in knowledge lost to *not* develop and maintain this information, however, is too great. The Oregon Flora Project will continue to forge relationships and garner support, allowing us to spread the fruits of our efforts for the benefit of all.



From April 1996 to April 2005, almost 140,000 OSU Herbarium specimens have been databased.

A databasing milestone

by Aaron Liston

Atlas Project Leader, Checklist Project Leader, and Oregon State University Herbarium Director

In April 2004, the Oregon State University Herbarium reached a milestone: a decade had passed since the first entries were made into a database of Oregon vascular plant specimens. The pioneer in those early efforts was Barbara Wilson, who together with the Carex Working Group (*OFN 2:1, 1996*) spearheaded the entry of *Carex* specimens into a relational database. Several later projects added data from the type specimens, the genus *Senecio*, and invasive plants. The database grew slowly through the 1990s reaching 20,000 specimens in late 1999.

The database received a major boost in the fall of 2001, when Scott Sundberg received funding from the Bureau of Land Management to database one specimen per county of every Oregon taxon. That project (*OFN 8:3, 2002*) resulted in a database of 55,000 specimens, and provided the first comprehensive data set for mapping Oregon taxa to the county level. Based on the success of that project, Scott Sundberg and I submitted a proposal to the US National Science Foundation to complete a database of all Oregon vascular plant specimens in the OSU Herbarium. We were thrilled when that 3-year project was funded in February 2003. The NSF grant funds data entry, quality control, and georeferencing of localities. The latter is a critical step that allows the specimens to be mapped in the Oregon Plant Atlas.

With the boost provided by that funding, and the herculean efforts of Ann Willyard, Thea Cook, Katie Mitchell, Stephen Meyers, and over 20 undergraduate students, the database now comprises nearly 140,000 Oregon specimens. Over 100,000 of these are georeferenced (see article by Katie Mitchell in this issue), and can be mapped through the Oregon Plant Atlas. We anticipate completion of the database this summer. In addition to the vascular plants, databases of our type specimens and over 50,000 fungal specimens are also available. Of course, the database will never be truly complete, as we plan to continue entering all new specimens. We also anticipate future enhancements, such as adding specimen images, linking our records with other national and international databases, and eventually entering all of our non-Oregon specimens as well.

The vascular plant specimen database can be accessed online at:
http://oregonstate.edu/dept/botany/herbarium/db.php

The Oregon Flora Checklist: nomenclatural decisions and other considerations

by Kenton L. Chambers

Checklist Project Leader and Professor Emeritus in Botany

Like any lengthy on-going project, the Oregon Flora Checklist has had to keep abreast of changing circumstances and new developments in relevant areas of science, in our case the rapidly advancing field of plant systematics. The Checklist Project began in 1989, when Karl Urban developed a computerized list of names drawn from the available floristic references that covered part or all of the geographical area of the state. Morton Peck's *A Manual of the Higher Plants of Oregon* was out of print and, in any case, was taxonomically far out of date. A checklist that would embody the latest taxonomic research to update the nomenclature of the flora was a necessary first step towards writing a new "Manual" for Oregon.

With the research herbaria of the University of Oregon, Oregon State University, and Willamette University now assembled in Corvallis, workers here can review all the specimens of each species, correct obvious errors in identification, and annotate each sheet with what we take to be its most accurate, up-to-date name. These names subsequently become incorporated in a computerized database, on which all other aspects of the Oregon Flora Project depend. The preparation of this database, comprising all the Oregon collections in the herbaria at OSU, is described by Aaron Liston on page nine.

The Checklist Project has proceeded much as planned, with the publication on family Asteraceae (574 taxa) appearing in 1998. Many other families have been completed, but some large, complex ones—grasses, roses, mustards, figworts, knotweeds, saxifrages, buttercups—are only partly finished. Databasing of species not yet revised for the checklist had to be done using whatever name or annotation existed on each specimen. If we modify these older annotations when we do a checklist treatment, the computer program easily adapts our changes to the database. Writing of the checklist is being done by volunteers, all of whom have professional taxonomic training.

In the time since the checklist was initiated, the field of plant taxonomy has undergone some major advances, which significantly affect our efforts. Many of the families and genera in our flora have been the object of molecular studies, principally involving DNA-based phylogenetics. Almost invariably this work leads to novel and sometimes surprising reinterpretations of species relationships, which in turn necessitate nomenclatural changes—often placing species in new, unfamiliar genera. We have noted such major changes occurring in family Asteraceae, for example, *since* the time we published our Oregon Checklist booklet. The volumes of *Flora of North America* for Asteraceae, to be published in 2005, will reflect these changes. I envision us having to re-annotate hundreds of herbarium specimens with new generic and specific names, and similarly to modify the names in the specimen database. It is essential that a cross-reference to synonyms is provided to users of the Oregon Flora Atlas, to connect back to the previous species names in common usage up to now.

The second area of scientific advance to be mentioned is that of computerization of taxonomic information and electronic access to keys, descriptions, illustrations, maps, specimen label data, specimen images, and taxonomic literature. Wireless access even allows such information to be obtained while in the field, not just at one's computer desk. To what extent this "information revolution" will take the place of traditional printed floras and checklists is a subject now being debated by taxonomists and floristics research specialists around the country. With the input of ideas and suggestions from those who will be using the results of the Oregon Flora Project, we will continue to evaluate these advances, so as best to steer the project in the direction of optimum usefulness and accessibility.

Building the online Plant Atlas

by Clayton Gautier,

Atlas Project Leader and Software Developer

Successful software design often depends on finding a good balance between dreams and reality. Consequently, when Scott Sundberg and I began discussing the Oregon Plant Atlas project almost a decade ago, our primary goal was to formulate an overall vision for the project that we felt would be achievable within the practical constraints of currently available technology and the project's limited resources. We must have done a pretty good job because what we decided we wanted to build back then is basically what we have today—a highly interactive, Web based client-server application that creates plant distribution maps on the fly and lets users "drill down" to get details on specific mapped locations by simply clicking on them.

This was definitely a tall order back in 1996 when building sophisticated software for the Web was still in its infancy, but we were fortunate. Sun Microsystems' Java was just then emerging as a popular and affordable enabling technology for Web development and Java appeared to have everything we

See Building the Atlas, page 11

> *"Thomas Jefferson told Lewis and Clark to go out there and identify everything. Well, it's been two hundred years and it is high time we had an inventory.*
>
> *"In a way, it is fitting that this should be such a grassroots sort of thing. Instead of a huge federal agency that could have put a few million into a Flora Project, but hasn't and won't, it is heartening to see that many dedicated people will get the job done."*
>
> — Jerry Igo, naturalist & botanist, Mosier, OR

Using the Oregon Plant Atlas

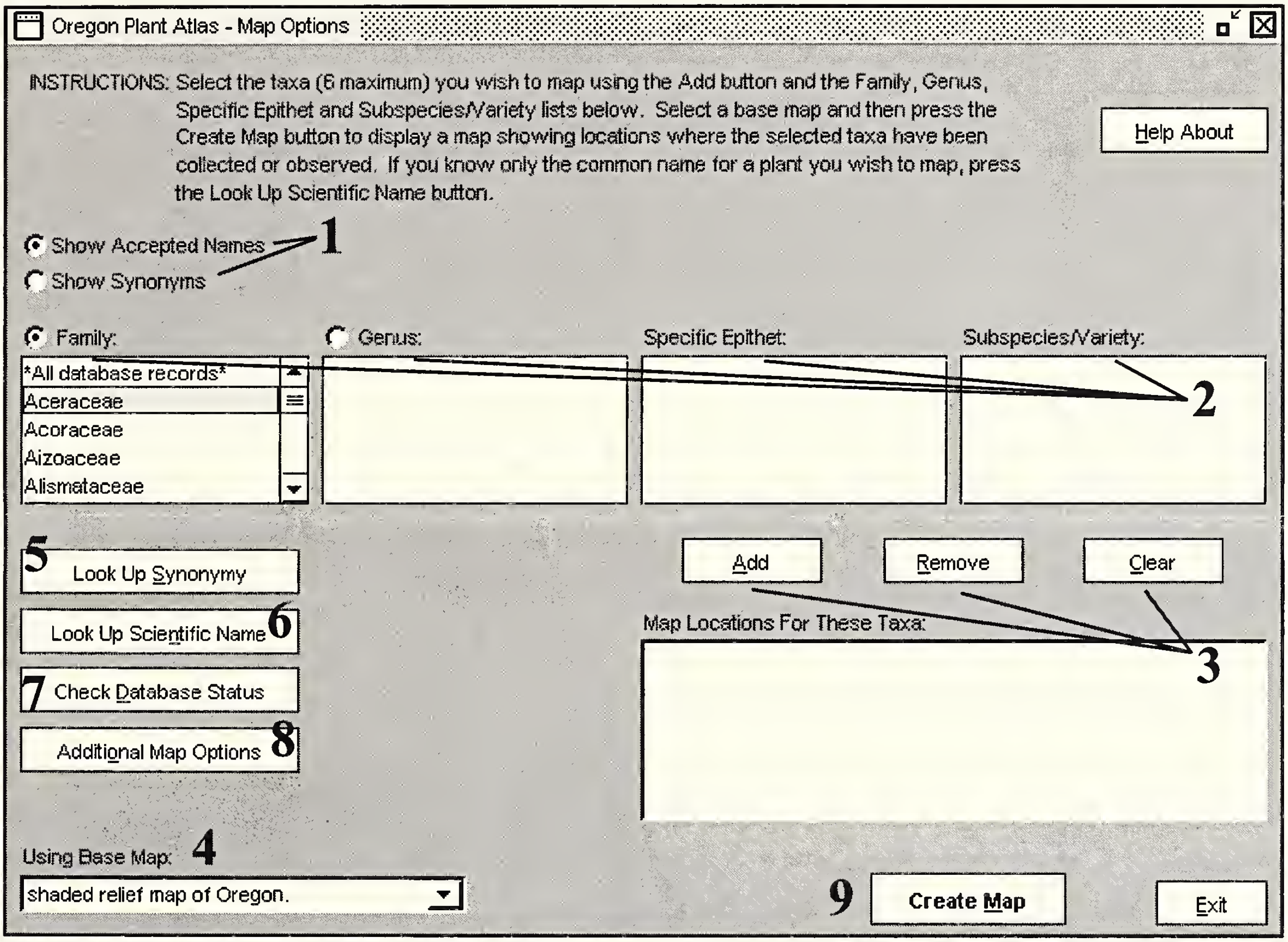
To use the Atlas go to www.oregonflora.org

1. Show Accepted Names, Show Synonyms buttons

These buttons let you choose whether the plant names you see are those accepted by the Oregon Flora Project (the default setting of **Show Accepted Names**), or are synonyms. When **Show Synonyms** is selected, the name lists show **only** alternate names that have been used in local floras or other scientific publications (for details visit *http://www.oregonflora.org/OFP/checklist.htm*). If you have trouble finding the scientific name you are familiar with in the name lists when **Show Accepted Names** is selected, try looking for the name again after selecting **Show Synonyms**.

2. Family, Genus, Specific Epithet, Subspecies/Variety lists

These lists are collectively referred to as "name lists." When the **Family** button is selected (the default), you can choose the scientific name for a given plant in a hierarchical way. When the **Genus** button is selected, you can choose from an alphabetical list of all genera. Double-clicking or hitting "return" on an entry selects it and causes the next list to the right to fill with associated entries. Alternatively, you can begin typing a name, and the highlighter will automatically jump there. Hit "return" on the desired name, and the next list to the right will appear.



INSTRUCTIONS: Select the taxa (6 maximum) you wish to map using the Add button and the Family, Genus, Specific Epithet and Subspecies/Variety lists below. Select a base map and then press the Create Map button to display a map showing locations where the selected taxa have been collected or observed. If you know only the common name for a plant you wish to map, press the Look Up Scientific Name button.

● Show Accepted Names
○ Show Synonyms

● Family:
○ Genus:

All database records
Aceraceae
Acoraceae
Aizoaceae
Alismataceae

Using Base Map: shaded relief map of Oregon.

Example of the Atlas ***Map Options*** *form.*

3. Add, Remove, and Clear buttons

To map the taxon you have selected from the name lists, click once on the **Add** button, and that plant name will appear in the box below the buttons. To map more taxa, return to the name lists and select taxa (as described in topic **2**) and **Add** to the list. Up to six taxa can be mapped at once. The **Remove** button deletes a highlighted name, and the **Clear** button deletes all items in the list. Note that only currently accepted names are allowed in this list. If you select a synonym, the Atlas will substitute the currently accepted name when you click on the **Add** button.

4. Base Map drop down list

This drop down list lets you choose the base map on which plant locations will be drawn. There are four base maps available: a color shaded relief map, a precipitation map, an ecoregions map and a county line map. All base maps are displayed at the same scale.

5. Look Up Synonymy button

This button brings up a dialog window that will display the synonyms, accepted name, plant family, and common names of the plant which has been selected in the names lists (see **2**). Likewise, it will provide the accepted name if the **Show synonyms** button (see **1**) has been selected.

6. Look Up Scientific Name button

This button brings up the **Look Up Scientific Name** dialog. Enter all or part of the plant's common name in the first text box and press the **Find** button. The dialog will then show all the common names in the database that contain an exact match. Select a name, press the **Look Up** button, and the currently accepted scientific name (including plant family) will appear.

7. Check Database Status button

This button brings up information about vouchered specimens of the genus selected in the **Genus** name list. Information is given about the nomenclature, the status of databasing at the OSU Herbarium, and the percent of specimens that have been mapped or are unmappable.

8. Additional Map Options button

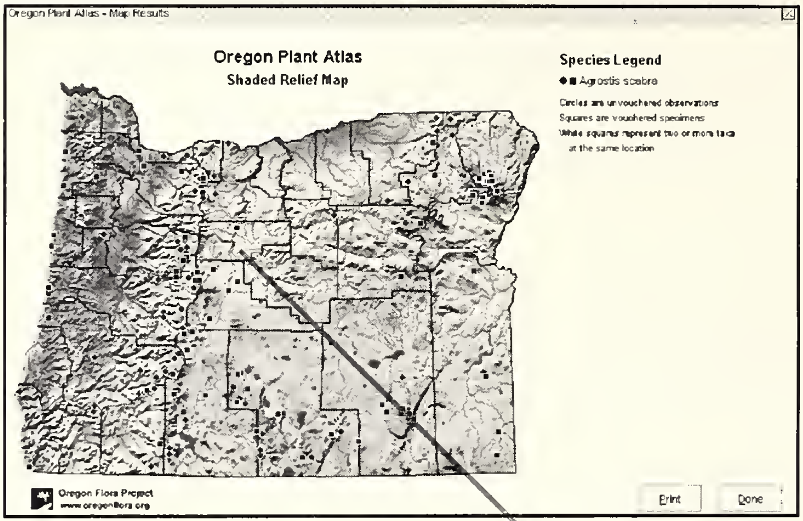
This button brings up the **Additional Map Options** dialog. This dialog allows the user to limit maps to include only records that are:

- from a certain observer/collector
- within a specific range of years
- specimen vouchers

If more than one of these limits is applied at the same time, they are used in combination. Clicking on the **Clear** button removes all of the limitations that have been set in the dialog. Note that clicking on **Clear** is the ONLY way to remove an observer/collector limit once a selection in the **Observer/Collector** list has been made.

9. Create map button

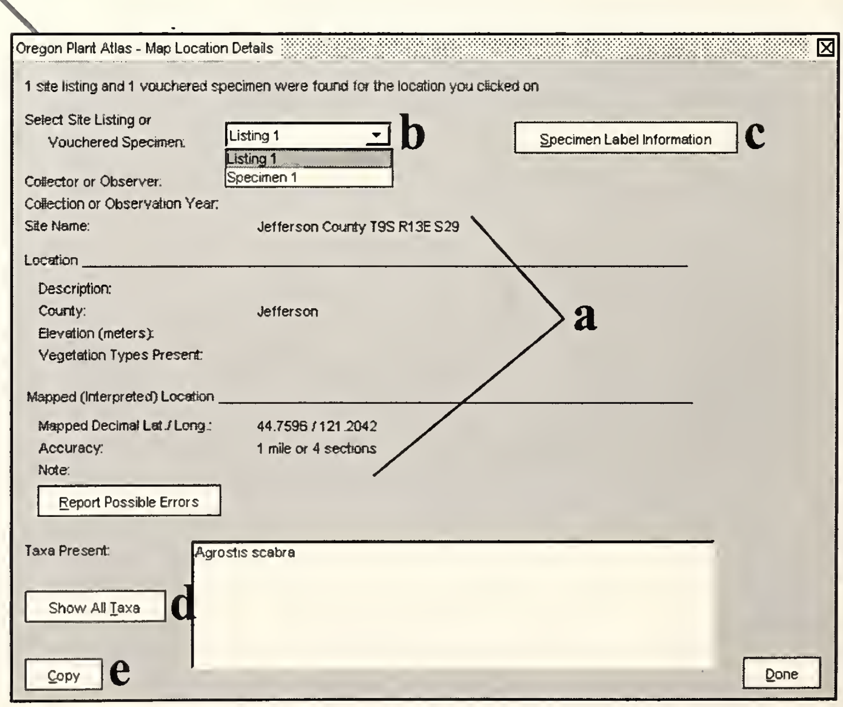
This button creates a map indicating the location of the plant(s) selected to be mapped (see **3**), given the base map (see **4**) and the options selected (see **8**). The map is displayed in the **Map Results** window. Depending on the speed of your computer and your Internet connection, creating a map may take anywhere from a few seconds to several minutes. Note however that once you've produced a map using a particular base map, subsequent maps using that base map will appear much more quickly if your browser caches Internet content on your local hard disk (most modern browsers do).


Oregon Plant Atlas - Map Results
Oregon Plant Atlas
Shaded Relief Map
Species Legend
◆■ Agrostis scabra
Circles are unvouchered observations
Squares are vouchered specimens
White squares represent two or more taxa at the same location
Oregon Flora Project
www.oregonflora.org
Print
Done

Clicking on a map dot brings up location information

Map Location Details

Clicking once on any dot on the map will bring up a **Map Location Details** screen (refer to the example screen below) unique to that plant observation or collection. The screen will list the available information within the database for that plant record, including the collector, year collected, location description, and an interpreted latitude-longitude value with its accuracy (see **a**). If the dot represents more than one specimen or site listing, you can select from all possibilities using the drop-down list (see **b**). When the dot represents a vouchered specimen (a square), clicking on the **Specimen Label Information** button (see **c**) will display a **Details** screen with all data transcribed from the herbarium specimen label. When the dot represents a site listing (a circle), a list of all the plants that were observed at that site can be seen by clicking on the **Show All Taxa** button (see **d**). When a plant being mapped is a rare, threatened, or endangered taxon, detailed information about the plant's location is withheld. The **Copy** button (see **e**) allows you to capture the text on the screen, including an expanded **Taxa Present** list, to your computer's clipboard and paste it into a word processor. This requires a file to be added to your home directory; instructions for creating this are in the help files (**Help** button on the Oregon Plant Atlas home page).


Oregon Plant Atlas - Map Location Details
b
Specimen Label Information
c
a
Report Possible Errors
Show All Taxa
d
Copy
e
Done

1 site listing and 1 vouchered specimen were found for the location you clicked on

Select Site Listing or Vouchered Specimen: Listing 1 (Listing 1 / Specimen 1)

Collector or Observer:

Collection or Observation Year:

Site Name: Jefferson County T9S R13E S29

Location

Description:

County: Jefferson

Elevation (meters):

Vegetation Types Present:

Mapped (Interpreted) Location

Mapped Decimal Lat / Long.: 44.7596 / 121.2042

Accuracy: 1 mile or 4 sections

Note:

Taxa Present: Agrostis scabra

How to print maps produced by the Atlas

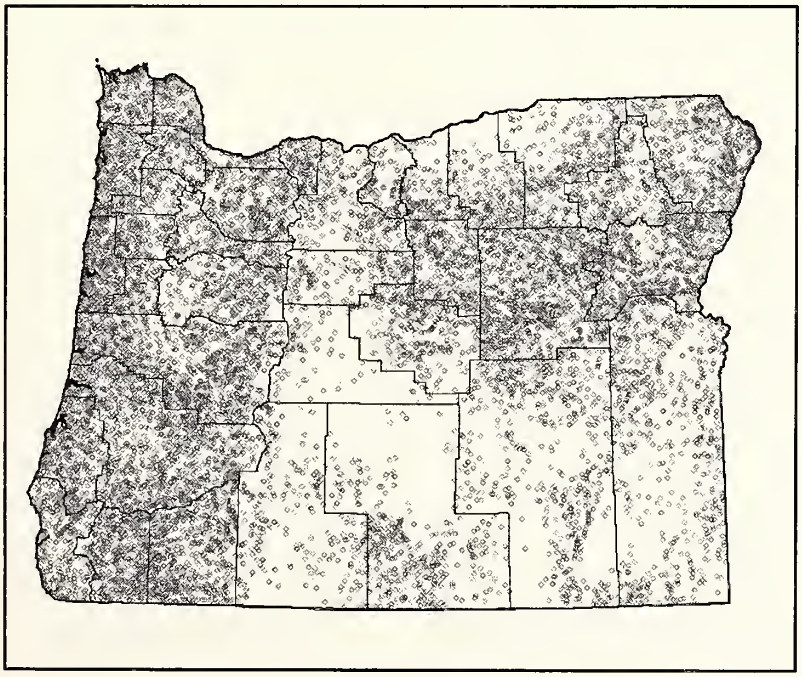
Printing of maps is supported directly only in the Java 2.0 version of the Atlas. If you are using the Java 2.0 version, you will see a **Print** button in the **Map Results** Window. If you do not see a **Print** button, you are using the Java 1.1 version of the Atlas which does not support printing directly. The Atlas home page automatically directs certain users to the Java 1.1 version because it is the only version that is known to run correctly on their systems. If you are using the Java 1.1 version, you can still print by using your operating system's screen capture feature to place a bitmap copy of the active window in the clipboard, and then paste the bitmap image into a program that has printing capability. For example, if your operating system is Windows and you have Microsoft Word, press **Alt+PrntScrn** when the **Map Results** window is visible (and active), switch to Word and execute **File→Edit→Paste.** Macintosh users can simultaneously press **shift + open apple + 4** and create a box to capture the map, which will then be available on the desktop.

Building the Atlas, continued from page 10

needed: a full featured, modern programming language; write-once/run-everywhere multi-platform support; ability to automatically download executable code to client workstations from a Web server; and support for client-server database connectivity. The Atlas makes use of all of these features of Java and in large part, owes its success to them.

Throughout most of its life, the Atlas has been based on the version 1.1 release of Java. This version, which first became available to developers in early 1997, has some serious shortcomings including limited user interface support and little or no support for printing and copy/paste operations. Sun addressed these problems with the release of Java 2.0 in late 1998. Unfortunately, this newer version of Java caused developers (including us) some serious headaches. For one thing, most popular browsers failed to provide full Java 2.0 support until just recently (in large part because of the Sun-Microsoft lawsuit). For another, Sun changed many of Java's programming interfaces (API's) which means that converting programs from Java 1.1 to Java 2.0 requires considerable rewriting of code and additional testing work. Despite the hurdles, we have recently managed to complete a much improved Java 2.0 version of the Atlas and are pleased to include it as part of the public release.

Acknowledgments: Thanks go to Dr. Jon Kimerling in the OSU Department of Geosciences for providing the base maps used by the Atlas and the cartographic projection logic for the algorithm that converts decimal longitude and latitude coordinates into base map plot points.



Map: Midpoints, locations along the stream equidistant from the mouth and the source, of named rivers and streams in Oregon created using a GIS (Geographic Information System) and recently added to the locality data set.

Atlas observation sources

- Oregon Natural Heritage Information Center (ORNHIC)
- Mt. Hood National Forest
- NPSO field trip species lists
- Personal observations
- Many other organizations, groups, and individuals

From data to dots

by Katie Mitchell

Oregon Flora Project Data Manager

For several years, the Oregon Flora Project has been assembling data about plant distributions to create a comprehensive, interactive atlas of vascular plants in Oregon. With over 4,500 taxa and approximately 96,000 square miles of land in Oregon, this requires an abundance of data. Plant lists from the Native Plant Society of Oregon, individual botanists, government agencies and scientific publications comprise the bulk of the Atlas data set. Herbarium specimen data from OSU herbaria and other herbaria (see *A reference for the future,* page 12) are also used.

Each source of data presents a challenge for incorporation into the Atlas. Whether an observation or collection, for the occurrence to be mapped, it must be given a set of latitude and longitude coordinates. Sometimes, plant occurrence records already have coordinates, in particular more recent records, due to the growing popularity of personal GPS units. Most often, the coordinates must be interpreted from other location information using the Project's locality data set. This is a list of standardized location names with corresponding center coordinates and fuzz values. The fuzz value represents the radius around the center which encompasses the entire area described by the location name. The fuzz value is displayed in the Atlas as the accuracy of the mapped location.

Nearly two thirds of the herbarium specimens entered into the database today have locations that are interpreted automatically, based on exact matches with the locality data set. For the other specimens, locations are interpreted by student workers. The students use a variety of tools and resources to determine the location described by the collector. Most commonly used are electronic maps, paper maps and online resources. In some cases, historic place names have been used and books on Oregon history are useful. Observations may also be interpreted, although most have township, range and section information and are interpreted automatically. Finally, the online Oregon Plant Atlas assembles all of the occurrences for each taxon selected, and plots them on a selected base map.

> *"What can I say about the Oregon Plant Atlas - FANTASTIC! I have spent a happy hour (or two) mapping the* Calochortus *species we saw, the* Penstemon *species we saw,* Xerophyllum *on the rainfall map, the rocky habitat* Silene *species we saw, etc. Really great. I hope to put some of the maps, of course with acknowledgment, in our Alpine Garden Society species list/report.*
>
> *"It really is the neatest on-line mapping scheme I have ever seen. I am lecturing at the British Ecological Society in September at a symposium to celebrate 50 years of the Biological Records Centre - they should see the Oregon Plant Atlas, which I will be plugging!"*
>
> — Dr. John Birks, visiting scholar, University of Bergen, Norway

A reference for the future: database management to accommodate growth

by Thea Cook

Oregon Flora Project Data Manager

The Atlas is one of the most exciting products of the Oregon Flora Project. Containing over 386,000 data points, this resource is the first comprehensive on-line mapping tool for Oregon plants to become available to the public. At the foundation of the Atlas are specimen and observation databases which are constantly updated by a combination of avid field workers and those who carefully perform the data entry. Launching of the Atlas at this time has required dedication and commitment by our staff and many volunteers who have, together, spent thousands of hours databasing, georeferencing and performing quality control.

Various data sources have been used to compose the Atlas. Our most reliable source is over 119,000 herbarium specimens. Approximately 102,000 of these are housed at OSU. The OSU collection also includes herbarium sheets originally from the University of Oregon and Willamette University. The latter is the collection that was maintained by Morton Peck, who used them to create the original *A Manual of the Higher Plants of Oregon* in 1941. Maps are periodically updated as new specimens are added to the herbarium. Data sets from 13 other herbaria have also been donated, representing over 17,000 mapped points. Their housing institutions are listed below.

Our most populous data set, made up of field observations, has created over 267,000 Atlas points. The data comes from individuals and organizations such as the Native Plant Society of Oregon and the Oregon Natural Heritage Information Network. They primarily originate from species lists but also include associated species cited on herbarium labels. Additional field information is always desired. To find out how you can contribute your field research to the OFP or otherwise become involved, please contact us at: *OFPatlas@oregonflora.org.*

Atlas herbarium sources

- Bureau of Land Management, Burns
- Bureau of Land Management, Lakeview
- Central Oregon Community College
- College of Idaho
- Eastern Oregon State College
- H.J. Andrews Experimental Forest
- Harvard University
- Lane Community College
- Linfield College
- New York Botanical Gardens
- Oregon State University
- Southern Oregon University
- Utah State University

Our data is constantly being updated, often by readers of the *Oregon Flora Newsletter*. Various individuals help us by supplying new information and assessing Atlas data and reporting errors they may discover. If you see an error in the current version of the Atlas, please report it by clicking on the erroneous point, then clicking the *Report Possible Errors* button and following instructions.

We at the Oregon Flora Project take our hats off to everyone who has helped bring the Atlas to life. Without you, the Atlas would still be a dream of many Oregon botanists. Instead, it is now one of the cornerstones of the new Flora of Oregon. Thank you.

We extend our hearty congratulations to staff member Thea Cook. She and husband Jeff are the proud parents of:

Henry Cameron Cook
born November 2, 2004

10th Anniversary Challenge Drive

by Linda Hardison

Oregon Flora Project Coordinator

The Tenth Anniversary Challenge Drive, held from November 2004 - January 2005, received wonderful support from 300 individual donors, the Native Plant Society of Oregon, and NPSO chapters. These generous donors contributed $39,597. With the matching $26,000 from anonymous donors, providing the impetus for this fund-raiser, the Oregon Flora Project has received $65,597! This money is a critical part of our budget; it helps pay the salaries of our staff and covers the *Oregon Flora Newsletter* publication costs. We are extremely grateful for the generosity shown by the many donors who are included in the list on page 13, and extend a special thanks to the contributors of our matching funds. The Oregon Plant Atlas is one of the many benefits your dollars have made possible—thanks to *all* donors for your support!

Thanks

We have received many generous donations supporting the challenge drive and as annual contributions. This list represents the names of those who have contributed since the last newsletter through May, 2005. It does not include those whose contributions were specifically designated in honor of Scott: these will be listed in the next newsletter. We recognize that *all* support which helps the Oregon Flora Project progress serves to honor this botanist and his legacy; we sincerely apologize for any inaccuracies in acknowledging your generosity.

Thanks to the following who have contributed to the Oregon Flora Project: The Native Plant Society and its Blue Mountain, Cheahmill, Corvallis, Emerald, Mid-Columbia, Siskiyou, and Portland Chapters.

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Did you know?

- Bear Creek is the most popular stream name in Oregon. According to the GIS data set, there are 94 Bear Creeks in our state.
- The ten most popular stream names in Oregon are listed below in descending in order.

1. Bear Creek	94
2. Dry Creek	92
3. Rock Creek	88
4. Mill Creek	64
5. Cedar Creek	64
6. Spring Creek	59
7. Beaver Creek	59
8. Deer Creek	58
9. Indian Creek	55
10. Camp Creek	54

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